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NAVAL POSTGRADUATE SCHOOL

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The Stigma of Failure in Organizations

15 January 2008

by

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and

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Prepared for: Naval Postgraduate School, Monterey, California 93943

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This paper presents a formal model of the (dis)incentives for entrepreneurial behavior in organizations. The model extends research on the stigma of failure into organizations by examining the implications of more conservative and more experimental organizational cultures on the incentives for entrepreneurial action by the corporate-funded employee. The discussion also derives implications for why organizations may chose to incubate new businesses in separate divisions, suggests why the stigma of failure may not always apply in public-sector organizations, and suggests why the development of entrepreneurship within organizations may be path-dependent.

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Abstract

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Executive Summary

This paper represents the outcome of a year-long analysis that began with observations we made about the implementation of RFID technologies in U.S. and allied militaries. Why, we asked, were Active RFID deployments proceeding at a clip, but Passive RFID deployments appeared to be crawling along, missing their deployment targets, or not getting deployed at all? Why might the U.S. Marines make a significant commitment to implementing Active RFID in their supply chain at a time when major commercial enterprises (such as Wal*Mart) have committed to implementing Passive RFID in their supply chains? After all, despite its current technological superiority, Active RFID is very significantly more expensive to implement in a large scale supply chain than Passive RFID, whose performance capability is rapidly evolving and catching up with user expectations. Why would managers so vastly prefer an expensive, Active system to an inexpensive, albeit less-proven, Passive system?

After accounting for the operational needs of various services and the technological capabilities of different kinds of RFID systems, we considered that behavioral factors might also be playing a role in the choice of which RFID systems to implement. We began to consider the hypothesis that fear of failure might be one factor affecting managerial choices about which kind of technologies to implement in their organizations. Why? Because failure is broadly stigmatized in all kinds of organizations and societies. Managers concerned with their career prospects therefore fear being identified as having failed, and this affects which projects they prefer to pursue. This led us to research the general phenomenon of stigma of failure in organizations.

The central message of the paper is quite intuitive and quickly summarized. Stigma of failure may be understood as a social mechanism for conveying information about the quality of managers. In conservative organizational cultures, managers are penalized for failing. Since managers know this is the case, they pursue safe projects that are unlikely to fail. If, in turn, they fail in these projects,

then failure indicates that they are likely poor managers. By contrast, in experimental organizational cultures, managers are willing to undertake risky projects that are more likely to fail; therefore, when failure does occur it tells little about the quality of the manager. Managers aren't penalized for failing when everyone in the organization knows they the project was a highly risky one. The net result is that organizations have different cultures that correspond with different kinds of behavior by managers – some more entrepreneurial, some more routine. These different kinds of organizational cultures are reflections of what has long been observed about attitudes towards failure across different nations and states. Compare the U.S. and Japan. Entrepreneurs who fail in the U.S. (especially in California) are unlikely to become outcasts in the managerial world. But fail in Japan, and members of society strongly penalize you. In our view, large organizations (such as the DoD) are likely to have their own *Californias* (i.e., divisions that attach a low stigma to failure) and they may have their *Japans* (i.e., divisions that strongly penalize failure). At the limit, ultra-conservative organizations may drive out entrepreneurial behaviors altogether.

Of course, this is the antithesis to the kind of innovative, risk-taking managerial ethos that various organizations in the DoD appear to be attempting to develop. However, as we explain in the paper, the analysis we provide also suggests reasons why the stigma of failure may not always apply in public-sector organizations. To the extent that independently-qualified professionals manage projects and the fate of projects is viewed as outside the control of project managers, then failure does not convey much information about the quality of project managers. This points to one of the many strengths of the DoD project management system.

1. Introduction

This study is based on seminal work by Landier (2005), who examines why countries and regions differ in their cultural acceptance of entrepreneurial failure. In some countries and regions, entrepreneurial failure is stigmatized; yet, in others, little social negativity is attached to failure. The term "stigma" refers to an attribute that is deeply discrediting that reduces "a whole and usual person to a tainted, discounted one" (Goffman, 1963, p. 3; Sutton & Callahan, 1987, p. 406). For example, while failed entrepreneurs are often stigmatized in France and Japan, a culture exists in California's Silicon Valley in which failure is practically a badge of honor (Bengtsson, 2005; Saxonian, 1994). Landier captured this basic phenomenon in a model of asymmetric information. In his study he explains that, when choosing potential projects, entrepreneurs in conservative cultures will pursue suboptimal, but safe, projects. If, in turn, they fail in these pursuits, this will indeed indicate that they are most likely unable to carry entrepreneurial activities to fruition. This information is circulated via a stigma of failure, which may be understood as a social mechanism for conveying information about the quality of individuals. In contrast, in experimental cultures, *all* entrepreneurs are willing to undertake risky projects that are more likely to fail; therefore, a failure event conveys less information about the quality of that entrepreneur. Hence, it makes less sense for stakeholders to penalize the entrepreneurs for failures, and the stigma is not attached to failed entrepreneurs.

In this paper we hybridize Landier's model with the literature on corporate entrepreneurship, which is defined as the process by which one or more individuals instigate a new organization or innovation within an existing organization (Sharma & Chrisman, 1999, p. 18). Corporate entrepreneurship is characterized by innovative, experimental behaviors that have a high probability of failure (Miller, 1983; Thomke, 1998). Several researchers have already examined factors influencing the creation of a corporate "atmosphere" in which entrepreneurial behaviors may flourish or be suppressed and have identified a potential role for how failure is managed by an organization (Burgelman, 1983; Stevenson & Jarillo, 1990). According to Farson and Keyes (2002), "[N]owhere is the fear of failure more intense and debilitating than in the competitive world of business, where a

mistake can mean losing a bonus, a promotion, or even a job." Prominent business leaders such as Jack Welch and Robert Shapiro appeared to have noted the effect of managers' fear of failure on their choices. During his tenure as CEO of Monsanto, Shapiro observed that employees were terrified of failing. Thus, he attempted to change perceptions about failure in order to encourage risk-taking. Jack Welch attempted to suppress fear of failure at General Electric by "rewarding failure." Such prominent efforts at managing failure in a positive way only serve to underline the reality that failure is stigmatized to some significant extent in many organizations. Yet, the mechanisms underlying this phenomenon are still not well understood. In a recent review, Kuratko and colleagues state that significant research questions remain; in particular, "research is needed to further clarify the linkage between the presence of specific qualities in an organizational context and individuals' (such as middle-level managers) decisions to act entrepreneurially" (Kuratko, Ireland, Covin, & Hornsby, 2005, p. 711).

In this study, our purpose is to explore the role of stigma of failure by modeling the (dis)incentive regime for corporate entrepreneurship. We proceed as follows: In the next section, we conceive a simple economic model in which we consider, in turn, self-financed entrepreneurship, VC (venture-capitalist)-financed entrepreneurship and corporate entrepreneurship. Section three discusses several themes that emerge from the model and relates them to other research on these topics. Conclusions follow.

2. Model

Case I: Self-financed Entrepreneur

We begin by considering a self-financed entrepreneur. This case is a benchmark, useful because the risk-neutral, self-financed entrepreneur can make decisions without concern for the market's imperfections.

In period 0, the entrepreneur initiates a project that matures in period 2. Before the project starts, the entrepreneur expects the project to have probability π_H of being successful, π_M of being mediocre and π_L of being a total failure. These probabilities are true only if the entrepreneur is intrinsically competent—a fact unbeknownst to him. The manager may be competent (with probability θ) or not. If he is not competent, the project will necessarily fail.

In period 1, the manager will receive a private signal (p_H, p_M or p_L) indicating the likelihood that the project will be successful. Each project has a start up cost I and a possible successful outcome X. Projects are initiated if and only if:

$$\theta\left(\pi_H p_H + \pi_M p_M\right)X - I > 0. \tag{1}$$

Clearly, $p_H > p_M > p_L$. If p_H = 80%, p_M = 30% and p_L = 0%, the entrepreneur receives a signal that the project has 80% chance of being successful, or 30% chance of being successful, or that it will fail for sure.

A self-financed entrepreneur would certainly continue if he receives a signal p_H. It does not mean that the project will certainly succeed (that pesky 20% chance of failure still exists!). For example, if the project is worth X = \$1Million, there is p_H probability of getting that return, and (1 - p_H) probability of not gaining it. So, the expected value of the project is $p_H X$ = \$800k.

If the same entrepreneur receives a signal p_M, he may or may not continue. He knows that he is a good manager; otherwise, his signal would definitely be p_L. So, he might continue if the expected payoff is greater than the payoff of starting all over again

with a new project, which may be more successful or not. In this example, the expected value of continuing this project is just $p_M X$ = \$300k. If the self-funded entrepreneur abandons the project, he starts a new venture which requires another start up cost I. Let's say that I = \$100k, π_H = 40%, $\pi_M = \pi_L$ = 30% and θ = 40%. This new venture has an expected value of $(\pi_H p_H + \pi_M p_M)X - I$ = (32% + 9%)\$1M - \$100k = \$310K. Since continuing is worth \$300k, a risk-neutral, self-funded entrepreneur would prefer to start over.

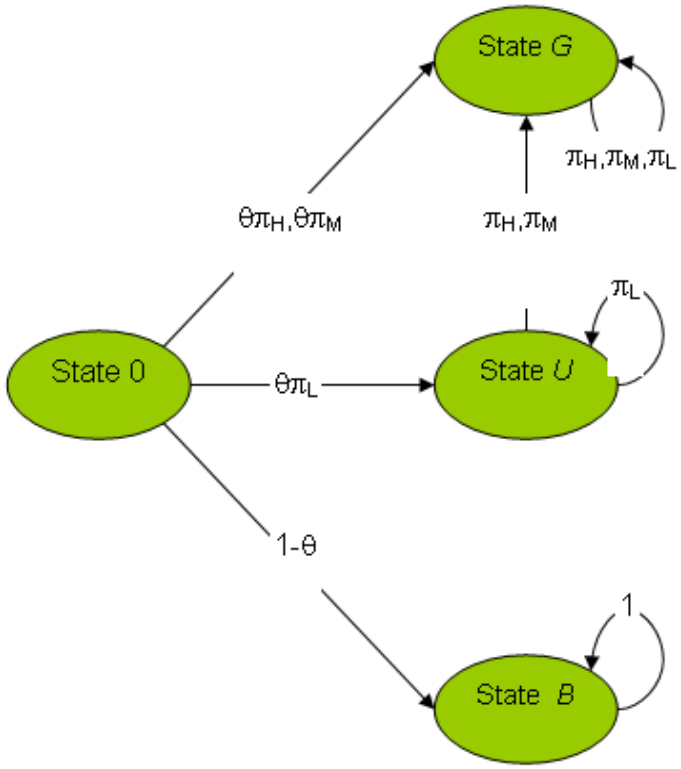

Figure 1. Transition Diagram (4 states)

If the entrepreneur receives a signal p_L, he is sure that the project is a dud. However, he does not know if it was his fault or not: the signal does not let him know if he is a competent manager. The pool of failed entrepreneurs includes incompetent managers $(1 - \theta)$ and unlucky competent managers $(\theta\ \pi_L)$. By receiving the signal p_L, the probability that he is a competent manager is now reduced to:

$$\theta' = \theta\pi_L / (1 - \theta + \theta\pi_L) < \theta. \qquad (2)$$

An entrepreneur with prior entrepreneurial experience follows a different decision process. Figure 1 shows the transition diagram with four states of competence recognition (reputation) and the probabilities to transition from one state to the next. All entrepreneurs are originated from state 0 (no prior experience). Initial experience moves them from state 0 to states *G* (good manager), *U* (good manager, but unknown to himself), or *B* (bad manager, unknown to himself). After *n* experiences, an entrepreneur that has seen p_H or p_M at least once knows that he is a good manager, and finds himself in state *G*. If the manager has only seen p_L, he does not know if he is good or not, and maybe in state *B* (which he will never leave) or in state *U* (which he might eventually leave, if he continues long enough). The probability that he is in state *U*, given that he has seen p_L in all *n* ventures that he has experienced, is:

$$\theta'_n = \theta\pi_L^n \Big/ \left(1-\theta+\theta\pi_L^n\right) < \theta' . \tag{3}$$

Clearly, as *n* increases, θ'_n approaches 0. In our example, suppose that *n* = 3, and the entrepreneur observed p_L each time. Hence, θ'_n = 0.77%. The risk-neutral entrepreneur initiates yet another project only if:

$$\theta'_n\left(\pi_H p_H + \pi_M p_M\right)X - I > 0 . \tag{4}$$

Case II: VC-funded Entrepreneur

Here, the venture capitalist provides initial capital *I* to fund a project with estimated earning potential *X*.[1] The venture capitalist receives a compensation *R* if the project is successful and 0 if it fails. The entrepreneur keeps *X*-*R* if successful and 0 otherwise. Entrepreneurs initiate projects if and only if:

$$\left(X-R\right) > 0 .$$

[1] Some results in this section have been proposed by Landier (2005). They are here presented for completeness.

The VC-funded entrepreneur has to deal with market imperfections because, unless he completes the project with some level of success, the VC never knows if he is competent or not. Moreover, the market wants to ensure that competent managers always complete projects with signal p_H to prevent strange behaviors such as "compulsive entrepreneurship" (an abnormal situation when the entrepreneur is not committed to bring the project to fruition). Also, the market wants the entrepreneur to treat projects with mediocre signal p_M according to the typical willingness to take risk in that market. The market induces this behavior by adjusting the cost of capital for previously failed entrepreneurs in period 2. If the cost of capital for failed entrepreneurs is *R*', he will continue only if:

$$p_M (X - R) > (\pi_H p_H + \pi_M p_M)(X - R').$$

If the entrepreneur sees a signal p_L, he has no incentive to continue this venture, but he may consider starting a new venture if the cost of capital is less than its potential return ($X > R'$). Since the market cannot distinguish competent managers among both entrepreneurs that failed voluntarily after receiving a mediocre signal and those that failed because they received a poor signal, all failed entrepreneurs are subject to the same cost of capital.

Subcase a) Conservative financial market

The conservative market is defined as the one that imposes high cost of capital to failed entrepreneurs. Consequently, if the entrepreneur sees p_M, his reaction is to continue with the project—even though he knows that it will provide only mediocre returns. Otherwise, his next venture will be funded with expensive capital. That is, in this market:

$$p_M (X - R_{CM}) > (\pi_H p_H + \pi_M p_M)(X - R'_{CM}).$$

Landier recognizes this as an *incentive compatibility constraint*, meaning that *R*' is the venture capitalist's return on successful entrepreneurship that induces the correct behavior for this market.

The risk-neutral venture capitalist, not knowing if competent managers lead the projects that she funds, requires a return on investment coherent with the project's probability of success, considering the composition of the respective pools of managers:

$$R_{CM} = \frac{I}{(p_M \pi_M + p_H \pi_H)\theta} \text{ and } R'_{CM} = \frac{I}{(p_M \pi_M + p_H \pi_H)\theta'_{CM}} \quad (5)$$

… where θ'_{CM} is the probability (in the eyes of the VC) that a second-timer is a good manager. In this market, the pool of failed entrepreneurs contains just entrepreneurs that received the signal p_L. Hence, θ'_{CM} is:

$$\theta'_{CM} = \theta\pi_L / (1 - \theta + \theta\pi_L) < \theta. \quad (6)$$

Since $\theta'_{CM} < \theta$, we have that $R_{CM} < R'_{CM}$, which is consistent with the hypothesis that conservative markets assign higher cost of capital to failed entrepreneurs. However, if the entrepreneur sees p_L, he knows that the project will fail; so, he drops it. He may ask the VC to invest in another idea—if the cost of capital justifies. He will start a new project if $\theta'_{CM}(\pi_H p_H + \pi_M p_M)(X - R'_{CM}) > 0$.

An entrepreneur with prior experience exposes the venture capitalist to a different decision process. If the venture capitalist has access to information about the final outcome of each of the entrepreneur's prior projects, the transition diagram in Figure 1 also represents the entrepreneur's reputation in a VC-funded conservative market. If the manager's record shows at least a successful event, he is in state *G*. If the record only shows failures, it implies that he has only seen p_L. Neither the VC nor the entrepreneur knows if he is good or not. The probability that he is in state *U*, given that he has seen p_L in all *n* ventures that he has experienced, is:

$$\theta'_{n,CM} = \theta\pi_L^n / (1 - \theta + \theta\pi_L^n) < \theta'_{CM}. \quad (7)$$

To fund the next venture by experienced entrepreneurs, the risk-neutral VC expects as payoff

$$R_{G,CM} = \frac{I}{p_M \pi_M + p_H \pi_H} \text{ and } R'_{n,CM} = \frac{I}{(p_M \pi_M + p_H \pi_H)\theta'_{n,CM}} \quad (8)$$

… where $R_{G,CM}$ is the payoff charged a manager in state *G,* and $R'_{n,CM}$ is the payoff charged a manager with *n* experiences, none of them successful. Clearly,

$$R_{G,CM} < R_{CM} < R'_{CM} < R'_{n,CM}$$

… where $n > 1$. In order to allow some level of entrepreneurship in the conservative market, we must have $X > R_{G,CM}$ (ventures which are led by managers that gained successful experience in other markets, or funded their own successful projects) or $X > R_{CM}$ (ventures in which venture capitalists fund inexperienced managers). As long as $X > R'_{n,CM}$, managers that failed their first *n* projects may attempt yet another venture. The appendix summarizes the results in this and in other sections.

Subcase b) Experimental financial market

The experimental market encourages a high level of entrepreneurship. It does so by keeping the cost of capital low for failed entrepreneurs, so managers that observe less-than-stellar signals about their projects may choose to abandon them to start new ventures that might provide better payoff.

If the entrepreneur sees the signal p_H, he is expected to complete the project—he cannot obtain a better signal than this. Yet, there is one valid concern in this situation: since the cost of capital for failed entrepreneurs is not punitive, the VC must adopt incentives that lead to the completion of projects that receive a good signal. Hence,

$$p_H (X - R_{EM}) > (\pi_H p_H + \pi_M p_M)(X - R'_{EM}).$$

Notice that by including the possibility of completing a mediocre project in second period, the inequality makes it even more profitable for the entrepreneur to continue the high-prospect project. If the signal is p_M, the entrepreneur in this market prefers to drop the project and start a new venture. To induce this behavior:

$$p_M\left(X - R_{EM}\right) < \left(\pi_H p_H + \pi_M p_M\right)\left(X - R'_{EM}\right).$$

Again, the possibility of completing both high-prospect and mediocre projects next period makes it even more profitable to abandon mediocre projects in the first attempt. Combining these two expressions, the incentive compatibility constraints in the experimental market are as follows:

$$\frac{\pi_H p_H + \pi_M p_M}{p_H} < \frac{X - R_{EM}}{X - R'_{EM}} < \frac{\pi_H p_H + \pi_M p_M}{p_M}. \tag{9}$$

Observe that the expression on the left is less than 1, and the one on the right is greater than 1. Hence, the cost of capital for failed entrepreneurs may or may not be higher than for first-timers: in this market, R_{EM} may be greater than R'_{EM} or not. The pool of first-time failed entrepreneurs includes managers that chose to fail after seeing p_M and managers that failed after seeing p_L (because of competence or not). In the eyes of the VC, the probability that a first-time failed manager is competent is:

$$\theta'_{EM} = \frac{\theta\left(1 - \pi_H\right)}{\theta\left(1 - \pi_H\right) + 1 - \theta} < \theta. \tag{10}$$

The risk-neutral venture capitalist, not knowing if competent managers lead the projects that she funds, requires this return on investment:

$$R_{EM} = \frac{I}{p_H \pi_H \theta}. \tag{11}$$

The transition diagram in Figure 2 shows that, over time, the entrepreneur can be in five different states in the experimental market. After n ventures, a manager that has seen p_H at least once finds himself in state (*G,K*) because he is good, and this is publicly known. If he has seen p_M at least once but never saw p_H, he is in state (*G,U*) because he is good, but he can't credibly convince the market that he is because he has never concluded a project. If he never observed p_H nor p_M, he is in state (*U,U*) if he is good, or in state (*B,U*) if he is bad, but he can't possibly know which is true. To ensure that entrepreneurs in state

(*G,K*) always conclude high-prospect projects and always forego mediocre projects, the incentive compatibility constraints are:

$$p_H\left(X - R_{G,EM}^{m}\right) > \left(\pi_H p_H + \pi_M p_M\right)\left(X - R_{G,EM}^{m+1}\right) \text{ and}$$

$$p_M\left(X - R_{G,EM}^{m}\right) < \left(\pi_H p_H + \pi_M p_M\right)\left(X - R_{G,EM}^{m+1}\right),$$

… where *m* is the number of failed ventures since the manager last experienced a successful project. These constraints simplify to:

$$\frac{\pi_H p_H + \pi_M p_M}{p_H} < \frac{X - R_{G,EM}^{m}}{X - R_{G,EM}^{m+1}} < \frac{\pi_H p_H + \pi_M p_M}{p_M}. \qquad (12)$$

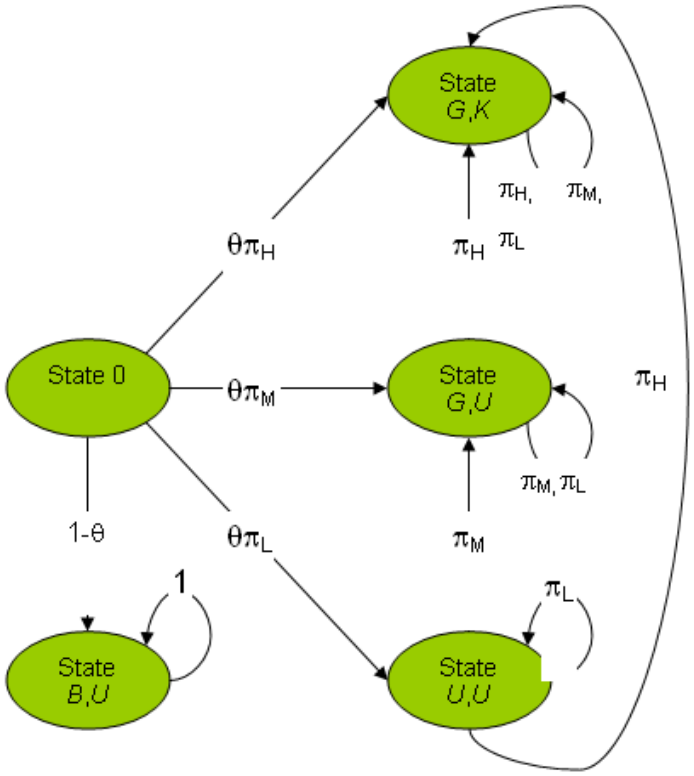

Figure 2. Transition Diagram (5 states)

Since the entrepreneur concludes only those projects that have high prospects, the VC expects her return on investment from entrepreneurs in state (*G,K*) to satisfy:

$$R_{G,EM}^{m} \geq \frac{I}{p_H \pi_H}, \ \forall m. \tag{13}$$

If the entrepreneur has never completed a project, the VC does not know if he is competent (even if the entrepreneur once received a private signal indicating that a project had mediocre prospects). In the eyes of the VC, the probability that a manager with *n* prior experiences without success is indeed a competent manager is:

$$\theta'_{n,EM} = \frac{\theta(1-\pi)^n}{\theta(1-\pi)^n + 1 - \theta} < \theta'_{EM}. \tag{14}$$

If the manager has observed p_M at least once, he is in state (*G,U*); he knows that he is competent for sure, but the market does not know. To ensure that he concludes high-prospect projects but abandons mediocre projects, the market imposes constraints that are similar to the ones for state (*G,K*):

$$p_H\left(X - R'_{n,EM}\right) > \left(\pi_H p_H + \pi_M p_M\right)\left(X - R'_{n+1,EM}\right) \text{ and}$$

$$p_M\left(X - R'_{n,EM}\right) < \left(\pi_H p_H + \pi_M p_M\right)\left(X - R'_{n+1,EM}\right).$$

These incentive compatibility constraints simplify to:

$$\frac{\pi_H p_H + \pi_M p_M}{p_H} < \frac{X - R'_{n,EM}}{X - R'_{n+1,EM}} < \frac{\pi_H p_H + \pi_M p_M}{p_M}. \tag{15}$$

Moreover, the VC expects return on investments from entrepreneurs that are not in state (*G,K*) to be:

$$R'_{n,EM} \geq \frac{I}{p_H \pi_H \theta'_{n,EM}}. \tag{16}$$

The manager that only received signal p_L after *n* experiences does not know if the projects failed because of him or not. His probability of being in state (*U,U*) is:

$$\theta'_{n,LM} = \frac{\theta\pi_L^n}{\theta\pi_L^n + 1 - \theta} < \theta'_{n,EM}\,. \tag{17}$$

If he sees p_L once again, he still doesn't know if he is a competent or a bad manager. He abandons and restarts a new venture because, according to the incentive compatibility constraints, $\left(X - R'_{n+1,EM}\right) > 0$, indicating that the venture capitalist is willing to fund another project at a cost that is acceptable to the entrepreneur. Hence, unlike those in the conservative market, entrepreneurs in the experimental market always have an opportunity to attempt a new venture, despite the number of failures they have experienced.[2]

Case III: Corporate-funded Employee

The corporation invests an amount *I* to launch a project under the leadership of an employee. If successful, both company and employee have positive payoff. For the corporation, the payoff *R* is the project return. For the employee, the payoff *X* could be a promotion, a raise or greater "reputation" among colleagues. Notice that in this environment, *R* >> *X*, so we do not consider the impact of *X* on *R*.

If the project is not successful, the company loses the initial investment, and the employee suffers a loss -*K*, which may be immaterial, damage to his reputation, loss of credibility among colleagues, demotion, or loss of employment. A risk-neutral employee initiates his project if the expected value of his payoff satisfies

$$\theta\left(\pi_H p_H + \pi_M p_M\right)X - \left(1 - \theta\left(\pi_H p_H + \pi_M p_M\right)\right)K > 0\,.$$

Hence, projects are initiated only if:

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[2] This result is quite intriguing, but must be taken with a grain of salt. As it is currently modeled, the whole payoff for both the VC and the entrepreneur occurs at the end of the project, if it is successful. Hence, the entrepreneur's personal effort is not being considered. If his time and effort is included in the model as a reservation price, and since $\theta_n \to 0$ as *n* increases, we expect that after *n** failures, the entrepreneur will choose not to invest his time on his very questionable entrepreneurial talent.

$$\frac{\theta(\pi_H p_H + \pi_M p_M)}{1-\theta(\pi_H p_H + \pi_M p_M)} > \frac{K}{X}. \qquad (18)$$

The employee also has to deal with market imperfections because the employer does not know about his competence to complete a project until he has completed at least one. Like the VC, the corporation expects that all projects with high prospects are brought to completion, and that mediocre projects be handled according to the organization's willingness to accept risk.[3]

In period 0, the employee initiates a project that matures in period 2. In period 1, the employee receives a private signal *p* about the project. The employee trades off the potential gain ($pX-(1-p)K$) for continuing the project with the certain loss for abandoning it immediately (-*K*). Consequently, the employee continues if $X > -K$, which is always true, as long as the signal *p* is greater than 0![4] Moreover, once the employee abandons or concludes his project, he may choose to take on another project with payoff space (*X*, *K*').

Subcase a) Experimental corporation

We call experimental corporation one that encourages entrepreneurship from its employees. Consequently, if the employee receives a mediocre signal in period 1, it expects him to abandon the project and start a new one. In order to induce these results, the corporation should provide a lower benefit to an employee for continuing the mediocre project than for starting a new project. If the employee receives a signal p_M, he knows that he is competent. Hence, to induce abandonment and restart, we have that:

$$p_M X-(1-p_M)K < (\pi_H p_H + \pi_M p_M)X-(1-(\pi_H p_H + \pi_M p_M))K'-K.$$

[3] This is in stark contrast with the financier's recommendation that all projects with positive NPV should be brought to fruition… However, most corporations prefer not to engage all projects with positive NPV, and limit the amount of debt that they commit.

[4] In fact, if the signal is $p = 0$, the employee is indifferent between stopping and continuing a project that has no future. In practice, this type of masochism would probably not occur, since the manager would accrue no satisfaction by investing additional time and effort in a failed project. To incorporate this dissatisfaction in the model, it suffices to make *K* marginally larger for projects starting in period 2.

If the employee receives a signal p_H, the employer expects him to continue the project, because the payoff of continuing a good project is greater than the payoff of abandoning it and starting a new venture:

$$p_H X - (1 - p_H)K > (\pi_H p_H + \pi_M p_M)X - (1 - (\pi_H p_H + \pi_M p_M))K' - K.$$

Simplifying these two expressions leads to the incentive compatibility constraints:

$$\frac{p_H(X + K) + K'}{(\pi_H p_H + \pi_M p_M)} > (X + K') > \frac{p_M(X + K) + K'}{(\pi_H p_H + \pi_M p_M)} \tag{19}$$

On the other hand, the employer does not know if a failed employee did so after seeing a mediocre signal, which would mean he is competent, or a low signal, which would mean his competency is unproven. The risk-neutral employer, not knowing if competent employees lead the projects that she funds, requires that the risk level of each venture meet the threshold:

$$\frac{I}{R} \leq p_H \pi_H \theta. \tag{20}$$

The transition diagram in Figure 2 can also be used to describe the five states of a corporate entrepreneur in an experimental organization. After *n* ventures, a manager that has seen p_H at least once finds himself in state (*G,K*) because he is good, and this is publicly known. To ensure that the entrepreneur always concludes high-prospect projects and always foregoes mediocre projects, the incentive compatibility constraints are:

$$p_H X - (1 - p_H)K^m_{G,EC} > (\pi_H p_H + \pi_M p_M)X - (1 - (\pi_H p_H + \pi_M p_M))K^{m+1}_{G,EC} - K^m_{G,EC} \text{ and}$$

$$p_M X - (1 - p_M)K^m_{G,EC} < (\pi_H p_H + \pi_M p_M)X - (1 - (\pi_H p_H + \pi_M p_M))K^{m+1}_{G,EC} - K^m_{G,EC}$$

… where *m* is the number of failed ventures since the manager last experienced a successful venture. These constraints simplify to:

$$\frac{p_H\left(X+K_{G,EC}^{m}\right)+K_{G,EC}^{m+1}}{\left(\pi_H p_H+\pi_M p_M\right)}>\left(X+K_{G,EC}^{m+1}\right)>\frac{p_M\left(X+K_{G,EC}^{m}\right)+K_{G,EC}^{m+1}}{\left(\pi_H p_H+\pi_M p_M\right)}. \quad (21)$$

This incentive compatibility constraint applies both to managers that have experienced past success as well as to those that are observing p_H for the first time. Since the employee concludes only those projects that have high prospects, the employer funds projects proposed by employees in state (*G,K*) that satisfy:

$$\frac{I}{R}\leq p_H\pi_H. \quad (22)$$

After *n-1* attempts, if the employee has observed a signal p_M at least once, but never observed p_H, he knows that he is competent, and he has just as much chance as any employee in state (*G,K*) to manage a project successfully. However, he may have been stigmatized for his lack of success. To ensure that he continues to propose new projects, the experimental organization limits his stigma to:

$$\frac{\left(\pi_H p_H+\pi_M p_M\right)}{1-\left(\pi_H p_H+\pi_M p_M\right)}>\frac{K'_{n,EC}}{X}. \quad (23)$$

This is the second incentive compatibility constraint in the experimental corporation. It ensures that employees in state (*G,U*) have the opportunity to take on new projects. Finally, if the employee never observed p_H nor p_M, he is in state (*U,U*) if he is good, or in state (*B,U*) if he is bad. He does not know if his projects failed because of him or not, and he suffers the unavoidable personal loss each time his project fails. His probability of being competent is:

$$\theta_{n,LC}=\frac{\theta\pi_L^n}{\theta\pi_L^n+1-\theta}<\theta. \quad (24)$$

Considering that his probability of being competent decreases with each attempt, the failed entrepreneur starts a new project only if:

$$\frac{\theta_{n,LC}\left(\pi_H p_H+\pi_M p_M\right)}{1-\theta_{n,LC}\left(\pi_H p_H+\pi_M p_M\right)}>\frac{K'_{n,EC}}{X}.$$

Employees who have not yet concluded any projects are in state (*G,U*), (*U,U*) or (*B,U*), and the employer cannot distinguish them. In the eyes of the employer, the probability that one such employee is competent is:

$$\theta_{n,EC} = \frac{\theta(\pi_M + \pi_L)^n}{\theta(\pi_M + \pi_L)^n + 1 - \theta} < \theta. \tag{25}$$

Hence, the employer funds projects initiated by employees that are not in state (*G,K*), and that have failed n projects, if they satisfy:

$$\frac{I}{R} \leq p_H \pi_H \theta_{n,EC}, \ \forall n. \tag{26}$$

This threshold limits the scope of new ventures and the number of attempts by employees without successful experience.

Subcase b) Conservative corporation

A conservative corporation is defined as one that avoids high-risk projects. Hence, whenever an employee observes p_H or p_M, he is expected to complete the project rather than taking on another venture. His personal payoff is greater continuing the venture than abandoning it, leading to:

$$p_M X - (1 - p_M)K > (\pi_H p_H + \pi_M p_M)X - (1 - (\pi_H p_H + \pi_M p_M))K' - K.$$

Consequently, the first incentive compatibility constraint is:

$$p_M (X + K) > (\pi_H p_H + \pi_M p_M)(X + K') - K'. \tag{27}$$

With this constraint, an employee that observes p_H would consider nothing other than continuing his project. However, if the employee observes p_L, he abandons and suffers personal loss, but he may still engage in a new project. The risk-neutral employer, not knowing if inexperienced employees are competent, requires that their ventures meet the threshold:

$$\frac{I}{R} \leq \theta\left(p_H \pi_H + p_M \pi_M\right). \tag{28}$$

The transition diagram in Figure 1 represents the four states of conservative corporate entrepreneurship. If the manager's record shows at least one successful event, he is in state *G*, and is expected to finish all projects for which he gets a private signal p_H or p_M. Thus:

$$p_M\left(X + K_{G,CC}^{m}\right) > \left(\pi_H p_H + \pi_M p_M\right)\left(X + K_{G,CC}^{m+1}\right) - K_{G,CC}^{m+1}$$

… where *m* is the number of successive failures since the last success. Since the employer concludes all projects that have high-level or mediocre prospects, the employer associates employees in state *G* with the risk level given by:

$$\frac{I}{R} \leq \left(p_H \pi_H + p_M \pi_M\right). \tag{29}$$

To ensure some entrepreneurship in this conservative organization, his stigma is limited to:

$$\frac{\left(\pi_H p_H + \pi_M p_M\right)}{1 - \left(\pi_H p_H + \pi_M p_M\right)} > \frac{K_{G,CC}^{n}}{X}, \ \forall n. \tag{30}$$

If the record shows that an employee has seen only failures, neither the employer nor the employee knows if he is good or not. The probability that he is in state *U*, given that he has seen p_L in all *n* ventures that he has experienced, is:

$$\theta_{n,CC} = \frac{\theta \pi_L^n}{\theta \pi_L^n + 1 - \theta} < \theta. \tag{31}$$

Considering that the probability of being competent decreases with each failed attempt, the failed entrepreneur starts a new project only if:

$$\frac{\theta_{n,CC}\left(\pi_H p_H + \pi_M p_M\right)}{1 - \theta_{n,CC}\left(\pi_H p_H + \pi_M p_M\right)} > \frac{K'_{n,CC}}{X}. \tag{32}$$

To fund the next venture instigated by experienced employees that are not in state G, the employer requires the enterprise meet the threshold:

$$\frac{I}{R} \leq p_H \pi_H \theta_{n,CC}, \ \forall n. \tag{33}$$

Subcase c) Ultra-conservative corporation

We call ultra-conservative the corporation with extremely low tolerance for project failures. In such an environment, employees that failed once will face high hurdles leading future projects. This type of organization would stigmatize failed managers, making sure that, if they observe p_M, they complete the project; and if they observe p_L, future projects won't receive corporate support. Obviously, some entrepreneurship is desirable, so successful employees are well-rewarded for completing their projects.

If an employee observes p_M, he avoids the stigma of failure and continues his project. Continuing the project has a better personal payoff than abandoning:

$$p_M (X + K) > (\pi_H p_H + \pi_M p_M)(X + K') - K'.$$

This incentive compatibility constraint is similar to the one in the conservative corporation. The risk-neutral employer, not knowing if competent employees lead the projects that she funds, requires that ventures by inexperienced managers meet the threshold:

$$\frac{I}{R} \leq \theta(p_H \pi_H + p_M \pi_M). \tag{34}$$

Likewise, a manager that observes p_L suffers personal loss $-K$ and abandons the project. The probability that he is a competent employee is:

$$\theta'_{UC} = \frac{\theta \pi_L}{\theta \pi_L + 1 - \theta} < \theta. \tag{35}$$

To ensure that the failed employee does not initiate a new venture, his personal payoff in a second attempt must be negative. This is achieved by setting a high stigma for failing a project a second time, *K*', which is secured by the expression:

$$\frac{\theta'_{UC}\left(\pi_H p_H + \pi_M p_M\right)}{1-\theta'_{UC}\left(\pi_H p_H + \pi_M p_M\right)} < \frac{K'}{X}. \tag{36}$$

For the ultra-conservative employer, the implicit risk in projects by managers that have failed is:

$$\frac{I}{R} > \theta'_{UC}\left(p_H \pi_H + p_M \pi_M\right). \tag{37}$$

This scenario can be represented by the three-state transition diagram in **Figure 3**, in which employees move from state 0 (inexperienced) to state *G* (good) or state *S* (stigmatized). Proposing projects in this environment is a dangerous gamble since, after a sufficient number of experiences, all managers eventually fail and become stigmatized.

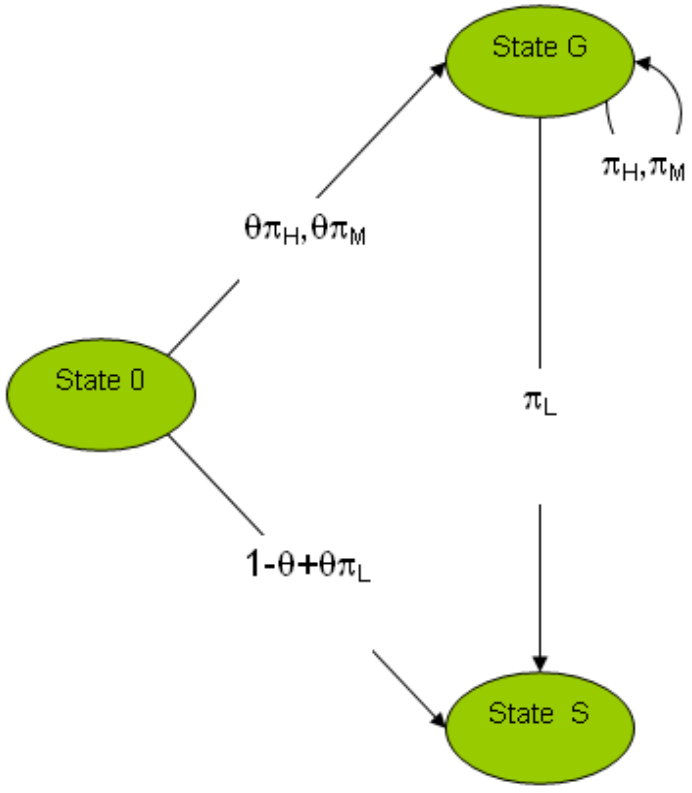

Figure 3. Transition Diagram (3 states)

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3. Discussion

Rather than discussing the model interpretation and related literature separately, in this section we discuss them jointly. We organize this discussion around several themes that are germane to the model.

3.1 How does corporate culture affect the incentives for corporate entrepreneurship?

Our model is related to the strategic management literature on corporate entrepreneurship. Research on corporate entrepreneurship suggests that, in some environments, a significant relationship exists between entrepreneurial behavior and performance in organizations both large and small (Zahra & Covin, 1995). Whereas Landier's concern is with the entrepreneurial culture of industries and regions, a central concern in strategic management theory is the role of corporate culture in nurturing employee behaviors that may ultimately lead to competitive advantage (Barney, 1991). Corporate culture may be viewed as, "a substitute for explicit communication. That is, culture is an unspoken language giving directives to the members of an organization" (Cremer, 1993). Burgelman (1983) suggests that senior management is influential in setting the environment for employee behaviors by how they manage failure in their organizations. In his formulation, Burgelman (1983, p. 1361) asserts, "Autonomous strategic behavior emerges, by definition, spontaneously. Corporate management thus need not encourage entrepreneurship; *it need only make sure not to suppress it*."[5] Other scholars have also argued that core organizational values and beliefs play a fundamental role in nurturing corporate entrepreneurship (Guth & Ginsberg, 1990; Zahra, 1991). Stevenson and Jarillo (1990, p. 24) argue that, "the treatment of failure would appear to be a critical component of the necessary motivation to pursue opportunity." Indeed, they hypothesized that organizations that attach less negative consequences to failure would exhibit more entrepreneurial behaviors. In an experimental study, Lee, Edmondson,

[5] Emphasis added.

Thomke, and Worline (2004) have identified tolerance for failure is indeed an important variable influencing employees' willingness to engage in experimental behaviors.

Our study contributes to this literature by showing that a particular aspect of corporate culture (the extent to which the culture stigmatizes failure) can be modeled as a relatively simple information asymmetry problem. As earlier noted, our starting point was the model proposed by Landier (2005). The central insight generated in Landier's paper is that multiple equilibria may arise corresponding to different attitudes of entrepreneurs and capital markets towards entrepreneurial failure. Landier's model is supported by an empirical study by Bengtsson (2005), who examined data on the restart behavior of failed entrepreneurs in different geographies. Bengtsson found that the disproportionately large amount of venture capital activity in California could partly be explained by Californian investors attaching a lower stigma to failed entrepreneurs. Landier's paper also corresponds with anecdotal data on the role of the stigma of failure in different geographies and industries, such as differences between investor attitudes towards failure in the US, France and Japan. Our model confirms these insights and extends them to the realm of corporate entrepreneurship, illustrating that the (dis)incentives for employees to engage in entrepreneurial behaviors can also be modeled within Landier's framework (i.e., we show this is also the case inside corporations). To use an analogy, corporations may have their own *Californias* (i.e., divisions that attach a low stigma to failure), and they may have their *Japans* (i.e., divisions that strongly penalize failure). At the limit, we have shown that ultra-conservative corporations will drive out entrepreneurial behavior—since after a sufficient number of trials, all managers will eventually fail and become stigmatized.

3.2 Why might existing firms choose to incubate new business initiatives as separate entities?

Our model also contributes to the literature regarding when innovations are commercialized within established organizations and when they are commercialized using corporate ventures that are standalone divisions of a corporation (Christensen, 1997). In recent years, a literature that addresses methods of commercializing innovations has developed (Gans & Stern, 2002; Cassiman & Ueda, 2006; Hellmann, 2007; Klepper & Sleeper, 2005). The focus of this literature is largely on if an innovation is instigated by an

existing organization or if it is commercialized by an independent start-up. However, there is also the related question of when (and why) an existing organization chooses to set-up a separate, wholly-owned venture for the commercialization of a new business idea, rather than develop the new business within its existing organizational infrastructure. For instance, when IBM developed the PC, it established a new venture based in Florida, away from the parent company infrastructure in New Jersey. Similarly, Lockheed's famous skunk works was deliberately set-up as an independent venture outside the corporate organization, albeit wholly-owned by the parent. Our model suggests one possible explanation for such decisions: the independently managed organizations are free to develop their own (more experimental) culture, less encumbered by the (conservative) culture of the parent organization. As such, they can develop an appropriate cultural regime that includes different expectations about the way to treat failure. This suggests that partitioning corporations into divisions may sometimes be motivated by efforts to establish different governance regimes with regard to failure management (Williamson, 1985).

A closely related issue is identified in a paper by Gromb and Scharfstein (2003). It concerns the reassignment of failed "intrapreneurs" within a corporation. In their model, the critical assumption is that firms and markets differ in their ability to observe and retain information about the skills and abilities of individuals. Intrapreneurship enables firms to learn about individuals and redeploy failed, but able, managers to new projects within the firm. Poorly performing intrapreneurs are stigmatized: no one wants to hire them because those that are on the job market are ones that established firms have chosen not to retain. By contrast, being a failed independent entrepreneur is not as bad a signal as that associated with being fired from an established firm: independent failure does not convey as much information about the ability of the entrepreneur. Gromb and Scharfstein's model thus adds another dimension to the analysis we develop in this paper by highlighting the role that more- or less-accurate information regimes may have in stigmatizing individuals. Again, the underlying insight is that *noisy* information regimes (i.e., experimental ones) are less likely to result in a stigma of failure than regimes in which inferences about individual abilities can be made more accurately (i.e., more conservative regimes).

3.3 Does stigma of failure also occur in public-sector organizations?

According to Morris and Kuratko (2002), the term entrepreneurship has appeared with increasing frequency in the public administration literature since the early 1990s. These authors argue that entrepreneurship is a universal construct that can be applied to public-sector organizations because the underlying dimensions of entrepreneurial behavior are the same regardless of context (Morris & Kuratko, 2002, p. 324). If this is so, then a logical question is: what role does stigma of failure play in public organizations? These organizations are typically viewed as highly conservative and might be expected to stigmatize failure in significant ways. According to Morris and Kuratko, “There is also career-related risk in the public sector, for although it is difficult to fire people, advancement can be hampered by visible failures” (p. 309).

To investigate this issue further, we undertook our own informal survey. We contacted four experienced DoD (Department of Defense) project managers and asked them whether project managers in the DoD were stigmatized for project failures. The results of this (admittedly anecdotal) process surprised us: the consistent answer these experienced PMs gave us is that failure is not stigmatized. We reason that there are two explanations for this. Both explanations cut to the heart of why stigma of failure occurs in the first place.

First, in Landier’s formulation, stigma of failure occurs as a result of informational constraints. Because the skill of entrepreneurs is difficult to observe directly, outsiders are forced to make inferences about individuals’ skills and abilities using observable information, such as venture success or failure. Information about project success or failure may be used in place of, or to augment, direct observation of an individual’s abilities (Holmstrom, 1999). However, if skill is independently verifiable, then the necessity of making vicarious inferences is eliminated. In the case of project management in the DoD, individuals follow a specific career-development program that involves several screening processes and the attainment of professional qualifications. As such, individual skills are verified through this career-development process. This process considerably decreases

the value of information about individual project successes and failures. This is especially so when a second factor is considered, as follows.

A second factor that might explain why there is little stigma associated with project failures in the DoD is the environmental context. For a typical large-scale DoD project, many factors pertinent to project success (or failure) are outside the direct control of the project manager. Numerous stakeholders have interests in such projects and seek to influence the outcomes of projects through political processes. Furthermore, many projects are long-lived, which means that several different project managers rotate through the project during its lifetime. These factors make observers more hesitant to attribute project outcome to individual project managers' performance, because the link between project outcome and individual performance is significantly diluted.

For these reasons, despite their conservatism, some public organizations appear not to stigmatize failure in the same way it is observed in private organizations. Without further investigation, we do not know to what extent our anecdotal evidence on DoD project management also applies to other public-sector operations. However, we note that further research in this area might be useful in determining the external validity of the model of corporate entrepreneurship we have developed in this paper.

3.4 Is the development of corporate entrepreneurship path-dependent?

The existence of a cognitive basis for domain-specific expertise (as delineated by Baron & Ensley, 2006; Mitchell, Smith, Seawright, & Morse, 2000; Sarasvathy, 2001) suggests that entrepreneurial success (especially over the course of several ventures or an individual's career) may be a function of skill rather than luck. If this is the case, might there be ways of evaluating entrepreneurial talent directly, rather than relying on vicarious inferences drawn from the success or failure of entrepreneurial ventures? Who would have the strongest incentives to invest in improving the independent evaluation of entrepreneurial ability? Are there coordination difficulties among entrepreneurs and evaluators that result in path-dependence in the development of entrepreneurial talent in a corporation?

Supporting Section 3.3, we note that in Landier's formulation, stigma of failure is an informational problem. Like many other informational problems, there may be multiple ways of—at least partially—solving this problem. Organizations (such as corporations or, in the case of independent entrepreneurship, venture capitalists) may be able to improve their screening processes by investing in formal evaluation processes that enable them to more accurately assess the entrepreneurial abilities of individuals independently of success or failure in past ventures. Formal organizational structures, such as human resources departments, also have the authority to directly observe individuals and collect significant quantities of data about them (for example, using 360-degree evaluation processes). Even venture capitalists may develop skills in screening and evaluating entrepreneurial talent, independent of the particular investment opportunities offered to them.

One upshot of our model is that, to the extent that corporations can lower the cost of evaluating entrepreneurial skill levels, direct evaluation may substitute the indirect inferences stakeholders draw from venture failure about the entrepreneurial skills and abilities of individuals. One can infer from our model that a change in the cost of evaluation technologies would lead to different "cultural" equilibriums in organizations, developing corporate cultures that would be more accepting of entrepreneurial failure. If corporations could better identify high-ability individuals who failed in previous ventures, they could offer them a lower cost of capital in future ventures. This would encourage more restarts and create value for the firm.

There are, of course, several problems in investing in screening entrepreneurial skills. One is that before a firm can accurately identify employees with entrepreneurial skills, they need managers who are themselves entrepreneurially skilled. A recent paper by Bernhardt, Hughson, and Kutsoati (2006) studies the strategic incentives that this creates. To summarize, workers are likely to distort investments toward skills that a firm's managers can best evaluate (as well as attempt to manipulate evaluator's judgments about their skills by their choice of project and by manipulating perceptions about their role in project successes and failures—Amit, Glosten, & Muller, 1990; Holmstrom, 1999). In a dynamic context (in which workers one day become managers), the population of skills in

an organization may skew over time. This may explain the low levels of entrepreneurship in many corporations: it suggests that the development of corporate entrepreneurship depends on having a combination of managers (skilled entrepreneurial evaluation) and employees (skilled entrepreneurship).

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4. Conclusion

The ancient Greeks and Romans used branding irons and knives to cut and burn physical signs—“stigmata”—onto the foreheads of slaves, criminals and traitors to advertise their moral status as unfit for society (Goffman, 1963). In the middle ages, the ritual pollution of individuals by slicing and scorching stigmata into the flesh was redirected towards people with mental disorders. In modern societies, people with mental illnesses are no longer physically mutilated, but stigmas of various kinds remain powerful social mechanisms. The stigma of failure is perhaps nowhere more intense than in the modern corporation, where ferocious competition in many industries creates enormous pressure on individual employees to be successful. In this paper, we have examined the role that different corporate cultures may play in stigmatizing entrepreneurial failure using a formal model of the (dis)incentives for entrepreneurial behavior in corporations. This model extends Landier’s work on the stigma of failure into the corporate firm by examining the implications of more conservative and more experimental corporate cultures on the incentives for the corporate-funded employee. Understanding the influence of corporate culture about failure may be important to this discussion, since prior research has found a significant relationship exists between entrepreneurial behavior and performance in both large and small organizations in many environments (Zahra & Covin 1995). Future research might usefully test this model and explore other interactions between corporate cultures and entrepreneurial activity.

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Appendix: Summary of Results

Case I: Self-financed Entrepreneur

	state 0	state *G*	state *U* or *B* (unknown to entrepreneur)
Payoff	$\theta(\pi_H p_H + \pi_M p_M)X - I$	$(\pi_H p_H + \pi_M p_M)X - I$	$\theta'_n(\pi_H p_H + \pi_M p_M)X - I$
signal p_H	Continues project to earn $p_H X$.	Continues project to earn $p_H X$.	Continues project to earn $p_H X$.
signal p_M	Continues project to earn $p_M X$.	Continues project to earn $p_M X$.	Continues project to earn $p_M X$.
signal p_L	Stops. Starts new project if $\theta'(\pi_H p_H + \pi_M p_M)X - I > 0$	Stops, and starts new project to earn $(\pi_H p_H + \pi_M p_M)X - I$	Stops, and starts new project if $\theta'_{n+1}(\pi_H p_H + \pi_M p_M)X - I > 0$

Subcase II-A: VC-funded Entrepreneur in a Conservative Market

	state 0	state *G*	state *U* or *B* (unknown to VC and to entrepreneur)
VC payoff	$R_{CM} = \dfrac{I}{(p_M \pi_M + p_H \pi_H)\theta}$	$R_{G,CM} = \dfrac{I}{p_M \pi_M + p_H \pi_H}$	$R'_{n,CM} = \dfrac{I}{(p_M \pi_M + p_H \pi_H)\theta'_{n,CM}}$
signal p_H	Continues project to earn $p_H(X - R_{CM})$.	Continues project to earn $p_H(X - R_{G,CM})$.	Continues project to earn $p_H(X - R'_{n,CM})$.
signal p_M	Continues project to earn $p_M(X - R_{CM})$.	Continues project to earn $p_M(X - R_{G,CM})$.	Continues project to earn $p_M(X - R'_{CM})$.
signal p_L	Stops, and starts new project if $\theta'_{CM}(\pi_H p_H + \pi_M p_M)(X - R'_{CM}) > 0$	Stops, and starts new project to earn $(\pi_H p_H + \pi_M p_M)(X - R_{G,CM})$	Stops, and starts new project if $\theta'_{n+1,CM}(\pi_H p_H + \pi_M p_M)(X - R'_{n,CM}) > 0$

Subcase II-B: VC-funded Entrepreneur in an Experimental Market

	state 0	state (*G,K*)	state (*G,U*)	state (*U,U*) or (*B,U*)
VC payoff	$R_{EM} = \frac{I}{p_H \pi_H \theta}$	$R^m_{G,EM} \geq \frac{I}{p_H \pi_H}, \ \forall m$	$R'_{n,EM} \geq \frac{I}{p_H \pi_H \theta'_{n,EM}}$	
signal p_H	Continues project to earn $p_H(X - R_{EM})$.	Continues project to earn $p_H(X - R^m_{G,EM})$.	Continues project to earn $p_H(X - R'_{n,EM})$.	
signal p_M	Stops, and starts new project to earn $\pi_H p_H(X - R'_{EM})$.	Stops, and starts new project to earn $p_H(X - R^{m+1}_{G,EM})$.	Stops, and starts new project to earn $\pi_H p_H(X - R'_{n+1,EM})$.	
signal p_L			Stops, and starts new project to earn $\pi_H p_H(X - R'_{n+1,EM})$.	Stops, and starts new project to earn $\theta'_{n+1,EM} \pi_H p_H(X - R'_{n+1,EM})$.

Subcase III-A: Experimental Corporate Entrepreneurship

	state 0	state (*G,K*)	state (*G,U*)	state (*U,U*) or (*B,U*)
Corp. risk	$\frac{I}{R} \leq p_H \pi_H \theta$	$\frac{I}{R} \leq p_H \pi_H$	$\frac{I}{R} \leq p_H \pi_H \theta_{n,EC}, \ \forall n$	
signal p_H	Continues project to earn $p_H X - (1 - p_H)K$.	Continues project to earn $p_H X - (1 - p_H)K^m_{G,EC}$.	Continues project to earn $p_H X - (1 - p_H)K'_{n,EC}$.	
signal p_M	Stops, and starts new project to earn $p_H X - (1 - p_H)K'_{EC}$.	Stops, and starts new project to earn $p_H X - (1 - p_H)K^{m+1}_{G,EC}$.	Stops, and starts new project to earn $p_H X - (1 - p_H)K'_{n+1,EC}$.	
signal p_L			Stops, and starts new project to earn $p_H X - (1 - p_H)K'_{n+1,EC}$.	Stops, and starts new project if $\frac{\theta_{n+1,LC} \pi_H p_H}{1 - \theta_{n+1,LC} \pi_H p_H} > \frac{K'_{n+1,EC}}{X}$.

Subcase III-B: Conservative Corporate Entrepreneurship

	state 0	state *G*	state *U* or *B* (unknown to VC and to entrepreneur)
Corp. risk	$\frac{I}{R} \le \theta\left(p_H \pi_H + p_M \pi_M\right)$	$\frac{I}{R} \le \left(p_H \pi_H + p_M \pi_M\right)$	$\frac{I}{R} \le p_H \pi_H \theta_{n,CC}, \ \forall n$
signal p_H	Continues project to earn $p_H X - \left(1 - p_H\right)K$.	Continues project to earn $p_H X - \left(1 - p_H\right)K^m_{G,CC}$.	Continues project to earn $p_H X - \left(1 - p_H\right)K'_{n,CC}$.
signal p_M	Continues project to earn $p_M X - \left(1 - p_M\right)K$.	Continues project to earn $p_M X - \left(1 - p_M\right)K^m_{G,CC}$.	Continues project to earn $p_M X - \left(1 - p_M\right)K'_{n,CC}$.
signal p_L	Stops, and starts new project if $\frac{\theta'_{CC}\left(\pi_H p_H + \pi_M p_M\right)}{1 - \theta'_{CC}\left(\pi_H p_H + \pi_M p_M\right)} > \frac{K'_{CC}}{X}$	Stops, and starts new project to earn $\left(\pi_H p_H + \pi_M p_M\right)X - \left(1 - \left(\pi_H p_H + \pi_M p_M\right)\right)K^{m+1}_{G,CC}$	Stops, and starts new project if $\frac{\theta_{n,CC}\left(\pi_H p_H + \pi_M p_M\right)}{1 - \theta_{n,CC}\left(\pi_H p_H + \pi_M p_M\right)} > \frac{K'_{n,CC}}{X}$.

Subcase III-C: Ultra-conservative Corporate Entrepreneurship

	state 0	state *G*	state *S*
Corp. risk	$\frac{I}{R} \le \theta\left(p_H \pi_H + p_M \pi_M\right)$	$\frac{I}{R} \le \left(p_H \pi_H + p_M \pi_M\right)$	$\frac{I}{R} > \theta'_{UC}\left(p_H \pi_H + p_M \pi_M\right)$
signal p_H	Continues project to earn $p_H X - \left(1 - p_H\right)K$.	Continues project to earn $p_H X - \left(1 - p_H\right)K'$.	N/A
signal p_M	Continues project to earn $p_M X - \left(1 - p_M\right)K$.	Continues project to earn $p_M X - \left(1 - p_M\right)K'$.	N/A
signal p_L	Stops.	Stops.	N/A

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